

Application Serial No. 09/148,723
Response to December 16, 2003 Final OA

MI22-981

In the Claims

CLAIMS

1. (Previously presented) A method of bonding balls of solder to bond pads on a substrate comprising:

dipping the substrate into a volume of the balls of solder;

contemporaneously retaining at least two of the balls of solder over different respective bond pads on the substrate in absence of flux; and

with the at least two balls of solder so retained, exposing the at least two balls of solder to bonding conditions effective to bond the at least two balls of solder with the associated bond pads.

2. (Previously presented) The method of claim 1, wherein the exposing comprises laser-bonding the at least two balls of solder.

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3. (Previously presented) A method of bonding balls of solder to bond pads on a substrate comprising:

placing at least portions of a plurality of balls of solder within a frame and in registered alignment with individual bond pads over the substrate by dipping the substrate into a volume of the balls of solder; and

while the ball portions are within the frame, exposing the balls of solder to bonding conditions effective to bond the balls of solder with the associated bond pads.

Claims 4-5 (Canceled).

6. (Previously presented) The method of claim 3, wherein the exposing comprises laser bonding the balls with the associated bond pads.

Claim 7 (Canceled).

8. (Previously presented) The method of claim 3, wherein the exposing comprises laser bonding the balls with the associated bond pads by fixing the position of a laser beam and moving the frame relative to the laser beam from one of the balls to another of the balls.

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Claims 9-10 (Canceled).

11. (Previously presented) The method of claim 3, wherein:
the placing comprises placing individual balls within individual holes within the frame; and
the exposing comprises reflowing the balls while the balls are within the individual holes, and further comprising, after reflowing, removing the frame from around the reflowed balls.

Claim 12 (Canceled).

13. (Previously presented) A method of bonding balls of solder to bond pads on a substrate comprising:
providing a frame having a plurality of holes sized to receive individual solder balls;
delivering the individual balls of solder into the holes from over the frame by dipping the substrate into a volume of the balls of solder;
placing the balls into registered alignment, while the balls are in the holes, with a plurality of individual associated bond pads over the substrate; and
bonding the balls with the individual associated bond pads.

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Claims 14-19 (Canceled).

20. (Previously presented) The method of claim 13, wherein the bonding comprises laser bonding the balls with the individual associated bond pads.

Claim 21 (Canceled).

22. (Previously presented) The method of claim 13, wherein the bonding comprises laser bonding the balls with the individual associated bond pads by fixing a position of a laser beam and moving the frame relative to the laser beam from one of the balls to another of the balls to effectuate the bonding.

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23. (Previously presented) A method of bonding solder balls to bond pads on a substrate comprising:

providing a frame having a plurality of holes;

inserting individual solder balls into the holes by dipping the substrate into a volume of the balls of solder, the balls being small enough to pass through the holes;

placing the frame into proximity with the substrate having bond pads positioned thereon, more than one of the plurality of holes individually holding an individual solder ball therewithin and in registered alignment with an associated bond pad on the substrate;

laser-bonding the solder balls to the associated bond pad; and

after the laser bonding, removing the frame from proximity with the substrate.

Claims 24-25 (Canceled).

26. (Previously presented) The method of claim 23, wherein said laser-bonding comprises moving the individual solder balls relative to a generally-fixed laser beam.

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27. (Previously presented) A method of bonding a ball of solder to a bond pad on a substrate comprising:

providing the frame having a hole;

providing a ball of solder having an outer surface;

retaining the ball of solder within the hole in an ambient processing environment which is generally uniform over an entirety of the outer surface of the ball by dipping the substrate into a volume of balls of solder; and

while the ball of solder is within the hole, bonding the ball of solder with an associated bond pad on the substrate.

Claims 28-29 (Canceled).

30. (Previously presented) The method of claim 27, wherein the bonding comprises laser bonding the ball.

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31. (Previously presented) A method of bonding balls of solder to bond pads on a substrate comprising:

providing a surface having a plurality of holes therein;

providing a plurality of balls of solder over the surface by dipping the substrate into a volume of the balls of solder;

depositing some of the balls of solder into at least some of the holes; and
bonding the balls of solder which were deposited into the holes to individual associated bond pads positioned on the substrate proximate the holes.

Claims 32-35 (Canceled).

36. (Previously presented) The method of claim 31, wherein the bonding comprises laser-bonding each ball to an associated one of the individual associated bond pads.

37. (Previously presented) The method of claim 31, wherein the bonding comprises laser-bonding each ball to an associated one of the individual associated bond pads by fixing a position of a laser beam and moving each ball into a path of the laser beam.

Claims 38-44 (Canceled).

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45. (Previously presented) The method of claim 1, wherein the exposing comprises melting the at least two balls.

Claims 46-47 (Canceled).

48. (Previously presented) A method of bonding balls of solder to bond pads on a substrate comprising:

placing at least portions of a plurality of balls of solder within a frame and in registered alignment with individual bond pads over the substrate by dipping the substrate into a volume of the balls of solder; and

while portions of the balls of solder are within the frame, exposing the balls to bonding conditions effective to bond the balls with the individual bond pads by laser bonding the balls with the individual bond pads.

49. (Previously presented) The method of claim 48, wherein the exposing the balls to bonding conditions effective to bond the balls comprises laser bonding the balls with the individual bond pads by fixing a position of a laser beam and moving the frame relative to the laser beam from one of the balls to another of the balls.

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50. (Previously presented) The method of claim 48, wherein:
the placing comprises placing individual balls within individual holes within the frame; and

the exposing the balls to bonding conditions effective to bond the balls comprises reflowing the balls by laser bonding while the balls are within the individual holes, and further comprising, after reflowing, removing the frame from around the reflowed balls.

51. (Previously presented) A fluxless process for bonding balls of solder to bond pads on a substrate comprising:

placing at least portions of a plurality of balls of solder within a frame and in registered alignment with individual bond pads over the substrate by dipping the substrate into a volume of the balls of solder; and

while portions of the balls of solder are within the frame, laser bonding the balls with the individual bond pads by laser bonding the balls of solder to the individual bond pads using a fixed laser beam.

52. (Previously presented) The fluxless process of claim 51, wherein the laser bonding the balls to the individual bond pads comprises fixing a position of the laser beam and moving the frame relative to the laser beam from one of the balls to another of the balls.

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53. (Previously presented) The fluxless process of claim 51, wherein:
the placing comprises placing individual balls of solder within individual
holes within the frame; and

the laser bonding the balls to the individual bond pads comprises reflowing
the balls by laser bonding while the balls are within the individual holes, and
further comprising, after reflowing, removing the frame from around the reflowed
balls.

Claims 54-56 (Canceled).